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ABSTRACT

Project "SPEED LEARN," a study which compared learning rates in beginning French and other behavior characteristics between adolescents with alpha training and comparable students without such training, was conducted with 62 rural subjects randomly divided into experimental and control groups. Both groups participated in an 8-week instructional program which consisted of three experiences: (1) a 6-week course in beginning French, (2) a 1-week training program using biofeedback instruments and autogenic techniques aimed at widespread achievement of the alpha brain wave state or pattern, and (3) a 1-week activity called "instant theater" in which participants performed for their peers in a series of self-expression exercises. In addition to the concentrated 1-week alpha training session, the alpha trained group received 10 minutes of relaxation exercises daily before the instructional period. All other experiences were the same for the two groups. The untrained group received alpha training during the final week while the trained group had "instant theater." Results showed no significant differences between the comparable groups on daily French tests and overall French achievement. However, there was a significant difference in dropout rates, retention, and frequency of disruptive behaviors, and attitudes and self-management skills showed marked improvement. (Author/AMH)

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SUPER POWER FOR EFFORTLESS AND EFFICIENT DIGEST OF LANGUAGE FOR EXPRESSION WITH ALPHA RHYTHMS IN NATURE

by

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TABLE OF CONTENTS

ACKNOWLEDGMENTS ii

ABSTRACT vi

INTRODUCTION 1

OBJECTIVES 3

REVIEW OF THE LITERATURE 4

DESIGN OF THE STUDY 7

PROCEDURES OF THE STUDY 9

TYPES OF TRAINING 12

Alpha Training 12
Instant Theater Workshop 16
French Curriculum 16

INSTRUMENTATION 20

TEST CONSTRUCTION 23

STAFF 24

STATISTICAL FINDINGS OF THE STUDY 24

SUMMARY 37

CONCLUSIONS AND RECOMMENDATIONS 39

BIBLIOGRAPHY 42

APPENDIX A: Teacher Constructed Daily French Tests (3) 45

APPENDIX B: Outline of French Curriculum 52

APPENDIX C: Observation Data Form 55

LIST OF TABLES

1. Distribution of Intelligence Quotients 11

2. Reliability Coefficients for Four Subscores and Total Score of Teacher-Constructed Daily French Tests Using the Cronbach Alpha Statistics 23

3. Daily Mean Wrist Temperatures for Students in the Experimental Group Measured Prior and Subsequent to Relaxation Exercises 25

4. A Test of the Significance of a Difference between Experimental and Control Groups on Daily Measures of Performance in Reading French 27

5. A Test of the Significance of a Difference between Experimental and Control Groups on Daily Measures of Performance in Speaking French 28

6. A Test of the Significance of a Difference between Experimental and Control Groups on Daily Measures of Performance in Writing French 28

7. A Test of the Significance of a Difference between Experimental and Control Groups on Daily Measures of Performance in Listening to French 29

8. A Test of the Significance of a Difference between Experimental and Control Groups on Daily Total Scores on Four French Subtests 30

9. Results of Five t-tests for Mean Differences between Experimental and Control Groups on the Four Subscores and the Total Score of the Pimsleur French Proficiency Test 31

10. Results of the Fisher Exact Test of the Difference of Two Independent Proportions of Students who Dropped out of French Classes before the Project's End 32

11. Report of Frequency of Disruptive Behavior for the Experimental and Control Groups within Eleven Observations of Ten Minutes Each 34

12. Performance of Experimental and Control Groups on a Locally Developed Attitude Survey 35

LIST OF ILLUSTRATIONS

1. Weekly Chronology of the Study 10

2. Typical Day During French Instruction 19

INTRODUCTION

A study was conducted at South Carolina State College in Orangeburg, South Carolina, to determine if training middle school children to control their alpha brain wave frequency was related to learning rates in beginning French. This report represents the conclusion of the initial phase of the research.

Although in recent years industry has moved into South Carolina, the state is principally an agricultural state with a large proportion of boys and girls growing up in rural areas. Children from rural areas traditionally have come from larger families with lower per capita income, a factor which has been shown to limit student access to educational experiences. Academically, urban children in the State achieve higher scores in reading, language arts, and mathematics than rural children (Matthews, James, and O'Tuel, 1979).

Since a great proportion of children continue to reside in rural environments, it seems reasonable to continue the search for better and more efficient methods of instruction to enable boys and girls to learn greater amounts so that they can compete more effectively with their peers. As part of this search, the study, "Super Power for Effortless and Efficient Digest of Language for Expression with Alpha Rhythms in Nature (SPEED LEARN)," was designed to investigate the effects of alpha training on learning of rural children between the ages of 10 and 14.

Alpha training, as described by Green and Green (1977), is a technique designed to teach the student to control the internal functions of the mind, body, and state of human potential. What one senses and controls is not the brain wave itself, but a state of consciousness. For instance, even though one usually can tell the difference between hot and cold hands, the way one actually learns to warm the hands or any other part of the body is through imagining a feeling of warmth permeating the part of the body in which blood flow is to be increased. Learning to control brain wave patterns does not depend on normal sensory feedback, but on the development of an awareness of subtle internal sensations that normally go unnoticed until a feedback device focuses attention on them.

The alpha state is characterized by a preponderance of brain waves between 8 and 12 Hertz (cycles per second). It is associated with an alert and nonfocused, but relaxed mind. In terms of sensitivity to stimuli, a person in the alpha state has a low arousal level. To achieve the alpha state at will, the individual must concentrate on inner awareness and, in so doing, minimize the effect on consciousness of outside stress. Some authorities (Brown, 1980; Ostrander and Schroeder, 1979; and Sexton and Poling, 1973) believe that being able to achieve and willfully to maintain the alpha state releases new energies for learning.

Other divisions within the brain wave spectrum are the beta, theta, and delta intervals. The beta waves, from 13 to 25 Hz, are associated with normal, focused, rational thought. Theta waves, from 4 to 8 Hz, are associated with a state of reverie, a twilight state, usually experienced just before sleep and linked, in some research studies, to creativity. Dominant theta waves are associated with periods in which thoughts and images seem to spring up from nowhere and when the mind is thinking without direction, on its own. Delta, below 3 Hz, is the characteristic frequency of sleep.

The biofeedback instrument, the encephalograph analyzer, is used to measure brain wave patterns. The human brain produces a continuous output of minute electrical signals. The strength of these signals is so small that it is measured in microvolts, or millionths of a volt. The signals can be detected and recorded accurately, however. To detect and record the changing electrical potentials, they must first be picked up by electrodes or sensors attached to the surface of the scalp and then amplified many thousands of times before they can be analyzed. When the encephalograph analyzer reproduces the frequency and amplitude of the brain wave on a chart, the record thus produced is known as an electroencephalogram.

Placement of sensors on the scalp makes a difference in the type of feedback information. These differences are presumed to ensue from the localization within the brain of specific functions. For instance, the occipital lobe is concerned with vision, the temporal lobe controls hearing, the frontal lobe directs motor activity, and the parietal lobe is associated with body senses (Restak, 1970). Research has determined that hemispheres of the brain specialize in modes of processing information. For a large portion of the population the left hemisphere processes data through a rational, sequential, and analytic procedure; the right hemisphere, however, uses simultaneous, holistic, spatial, and intuitive operations (Sperry, 1975; Ornstein, 1976; and Levy and Trevarthen, 1977). Therefore, it is essential in alpha training to place sensors or electrodes on the areas of the brain which will yield the kind of information needed by the learner for the purpose of the training. In the section of the report describing alpha training the placement of the sensors for the study is explained.

OBJECTIVES

Project SPEED LEARN investigated the effects of alpha training on medium- and long-term learning of preadolescents (10-14 years of age) in Orangeburg County in the midlands of South Carolina. A comparison of student recall was made between the traditional method of teaching a foreign language (French) and the new method involving the identical instruction after the students had received training and daily exercises in achieving the alpha brain wave state.

Specifically, the objectives were as follows:

1. To compare medium-term (approximately 21 hours) recall of rural middle school children receiving alpha training with comparable students taught by the same method with no training.

2. To compare long-range (approximately 6 weeks) recall of rural boys and girls taught by the same two methods in Objective 1.

The objectives stated as research hypotheses are as follows:

1. Pupils who study French after training and daily exercises designed to achieve the alpha brain wave state will demonstrate superior recall of lesson content at the beginning of the following day's lesson than comparable pupils who are not participants in the alpha brain wave training.

2. Pupils whose study of French was undertaken with alpha training will demonstrate greater overall cognitive achievement in French than comparable pupils whose study of French was undertaken without alpha brain wave training.

REVIEW OF THE LITERATURE

There is a conspicuous absence of scientific investigations specifically concerned with the relationship between alpha training and learning rates of average learners. The majority of research to date deals with exceptional children or adults. Furthermore, findings from the studies are varied. Some evidence substantiates the value of alpha training for changing behavior while other findings contradict it.

Biofeedback instruments permit trainers and trainees accurately to determine when the trainee enters the alpha state. Joe Kamiya (1962) discovered that if persons were informed continuously about their brain rhythms, as seen by an electroencephalograph (EEG), they could learn to alter their frequencies at will. Barbara Brown's research (1974; 1977) further developed the idea that individuals could be trained to control brain wave activity.

Using biofeedback instrumentation, Carter and Russell (1981) found significant increases in reading but not in arithmetic skills as a result of EEG alpha and beta training. In a study with learning disabled children, Gracenin and Cook (1977) found that alpha training with the experimental group produced no significant gains over the control group when total reading scores were examined. On the other hand, Patmon and Murphy (1978) in a study of hyperactive learning-disabled adolescents reported improved reading achievement on the Wide-Range Achievement Test with training in the control of EEG frequency.

Nall (1973), after informally observing what appeared to be positive effects of alpha training with hyperactive children in a special school for children with behavior problems, conducted a study using an alpha training group, a placebo group, and a control group. Comparisons between the training and the placebo groups were inconclusive, although Nall noted that the training appeared to be very beneficial with particular children.

Individuals using other methods than biofeedback to produce the alpha state report more successes in achievement. Luthe (1969), with a method known as autogenic, reports long-term effects on the improvement of scholastic performance and standardized test scores. Autogenic therapy basically consists of sitting in a chair or lying down for 10 to 15 minutes a day while concentrating on feelings of warmth and heaviness in the extremities. These exercises are followed by meditation exercises, which involve various forms of visual and sensory imagery.

While using autogenic training with Japanese children and adolescents for various medical disorders, Luthe (1969) noticed changes in behaviors and interactional processes.

Teachers also reported noticeable improvements in classroom participation, a decrease of distractibility, improved attention, better concentration on tests, and increased homework performance.

Sellers (1974) reported the results of a project using autogenic training over a four-year period with 240 underachieving high school and college students. He hypothesized that many students of normal intelligence perform below their ability because of severe stress or anxiety. Furthermore, many students who have been "negatively conditioned" by years of anxiety and failure learn to protect their egos by rejecting academic and intellectual endeavors. His results indicate positive treatment effects on concentration, study habits, listening ability, reading and writing skills, and an increased sense of self-worth.

Harlem (1975) received positive results using autogenic training with black second graders in a classroom setting. Relaxation trained students demonstrated superior performance in the Matching Familiar Figures Test, forward and backward digit span tasks, a paired associate task and problem approach exercises. It appeared that the relaxation training facilitated the development of internal controls (or self-controls) which enabled the students to demonstrate increased capacities for attention, concentration, memory, and cognitive mediation. Trained students responded with increased flexibility to task demands as evidenced by more productive task approaches than control group students. The treatment was effective with both high and low achieving male and female pupils. Treatment gains did not dissipate, but were maintained over time.

Straughan and Dufort (1969) investigated the effects of verbally induced relaxation on the verbal learning and recall abilities in low- and high-anxiety subjects. Anxiety groups were chosen on the basis of scores on the Minnesota Multiphasic Personality Inventory. Subjects were assigned to one of four treatment conditions: (1) relaxation before the learning trial, (2) relaxation before the recall trial, (3) relaxation before both learning and recall trials, and (4) no relaxation at all. Half of each group was exposed to a learning trial of low difficulty paired associates, the other half to a high difficulty list. Recall was tested immediately after exposure to the list and again forty-eight hours later. Using latency (time interval between question and reply) as the dependent measure, the investigators found that the effects of relaxation differed as a function of the anxiety level. On the immediate recall test, relaxation produced faster responding in the high-anxious subjects and slower responding in low-anxious subjects when compared to nonrelaxed subjects with the same anxiety levels. Relaxation effects were greater for high difficulty lists than for low difficulty lists. On the delayed recall test, relaxed high-anxious subjects again responded faster and relaxed low-anxious subjects slower than their nonrelaxed counterparts. Additionally, relaxation before the learning trial intensified that effect as compared to relaxation before recall.

Cue-controlled relaxation, a technique using breathing exercises along with suggestive words such as calm, warm, and relaxed, proved beneficial for children 7 to 15

years of age with emotionally related learning problems. With a 15 minutes practice session before the instructional period, Palmeri (1980) found that emotionally disturbed children made significant gains on achievement, measured by the Peabody Individual Achievement Test, and on the attentiveness and aggressiveness factors of the Conners Teacher Rating Scale when compared to other emotionally disturbed children receiving the same instruction who had not received the training. Learning-disabled children did not show significant improvement in achievement but did improve significantly on the attentiveness factor of the Conners Scale. Palmeri concluded that relaxation training would be helpful as a supplement to other remedial techniques for both emotionally disturbed and learning disabled students.

Gerogi Zozanov (1969), a Bulgarian at the University of Sofia, found that by teaching the brain to relax from all stress, the mind could learn at a rate from five to fifty times faster and far more efficiently. The method now is known as "Suggestopedia," and has proven that hundreds of adults effortlessly learned a foreign language, the vocabulary and grammar of which were equivalent to a two to three-year college course, in as little as sixty days. Follow-up studies revealed, also, that as late as a year afterwards virtually none of the materials had been forgotten.

Florence Schale (1970) found that students at Northwestern University when taught to relax to the alpha state learned to read much more rapidly. From 1 to 5 percent of her students developed the ability to read at rates of over 20,000 words per minute.

Speed learning has been tried with middle school children. An eighth grade science class at the Woodrow Wilson Junior High School in Des Moines, Iowa, learned science material rapidly by breathing rhythmically in time to music as they heard the material read to them in various intonations paced to the music. This same method was tried in DeKalb County Schools in Georgia for remedial reading instruction and gains of one year's reading ability were noted within a few weeks (Ostrander and Schroeder, 1979).

It is clear from the studies reported that more research needs to be conducted in the area of relaxation training and learning. The present study, using a variety of methods to assist the child in achieving the relaxed alpha state, will help increase the limited amount of research available on learning and the brain wave states.

DESIGN OF THE STUDY

The objectives of the study, a comparison of (1) medium-term, and (2) long-range recall with alpha training before French instruction with comparable students without training, were broached by operationalizing the variables within the research hypotheses.

Operationalization of Variables

The independent variable in both hypotheses was participation in the alpha brain wave training. The variable was operationalized in two levels, a treatment group (Group T) and a control group (Group C). Group T received special training and daily exercises to increase their participation in the alpha brain wave pattern above the normal level. Further, electroencephalographic (EEG) procedures were used periodically to ensure that the treatment was effective. Group C received no such training or exercises and was considered to participate in the alpha brain wave pattern no more nor less than comparable students in traditional classes.

In an attempt to reduce contamination of the study produced by involving only one group in alpha training, an activity with a comparable interest level and using comparable electronic gadgetry was provided to students within the control group. They were given experiences in instant theater with video recording and instant replay. Students were given the explanation that the division into two groups was necessitated by the scarcity of equipment with which to provide either alpha training or instant theater experience. Neither group was informed that an experiment was underway. The treatment group was invited to view the relaxation training and the later daily exercises as remote from and unrelated to the French instruction. If an effect was observed between relaxation and learning, the effect then would be more credible, uninfluenced by undue cooperation by a learner who believed the researcher expected improved rates of learning.

The dependent variable in the first hypothesis, recall of medium-term lesson content, was operationalized as the mean number of points earned by a class on each daily test. Daily tests were constructed by the researcher to assess the level of mastery of objectives pursued within the daily lesson. Results of psychometric analysis of these tests will be presented in a subsequent section.

The dependent variable in the second hypothesis, overall cognitive achievement in French, was measured as a vector of subscores from the Pimsleur Modern Foreign Language

Proficiency Tests: French. These subscores were listening comprehension, speaking proficiency, reading comprehension, and writing proficiency. The test was administered as a posttest to both treatment groups at the end of the French instruction.

The two hypotheses expressed in fully operational form were as follows:

Hypothesis I

Group T students will demonstrate higher average number of points earned on all daily tests than Group C students.

Hypothesis II

Group T pupils will demonstrate a higher average score on each of the four subscores of the Pimsleur Modern Foreign Language Proficiency Test: French than Group C.

PROCEDURES OF THE STUDY

Sample

Sixty-two students, 56 blacks and 6 whites, were selected randomly from a group of 167 middle school students with no previous instruction in French who volunteered to participate in a set of three learning experiences offered in the summer at no cost at South Carolina State College. Announcements in the public and private schools and through local communications media were made in order to stimulate subjects to volunteer for the learning experience. The three experiences were a six-week course in French, and two special one-week sessions. (See Figure 1 for the weekly chronology of the study). The order of the two special sessions was reversed to comprise the treatment variable. These two sessions were: (1) a one-week education program in alpha training, aimed at widespread achievement of the alpha state or pattern, as verified by the EEG, and (2) a one-week activity entitled "Instant Theater Workshop," in which participants performed for their peers in a series of self-expression exercises. This later activity, for purpose of the present research, served as a placebo and a device for keeping subjects blind to the nature of the research design.

Once the participants for the set of learning experiences were selected from the volunteers, they were assigned randomly to two groups, a treatment group (Group T) and a control group (Group C). The use of a convenience sample in the present research is defended through the following two arguments: (1) only a convenience group could be kept blind to the nature of the research; and (2) although the experimental outcome may not be as widely generalized as one may wish, nonetheless, the study attempted to verify the existence of a meaningfully large experimental effect in several areas, and, as such, is a reasonable expectation of an initial investigation into the topic.

The Otis-Lennon Mental Ability Test was administered to the sample during the first week of experiences to ascertain if there was a significant difference in intelligence between subjects in Group T and Group C. No significant difference was found between Group T's mean score, 99.13, and Group C's mean score, 100.38. (See Table 1 for the distribution of IQ scores).

WEEKLY CHRONOLOGY OF THE STUDY ~

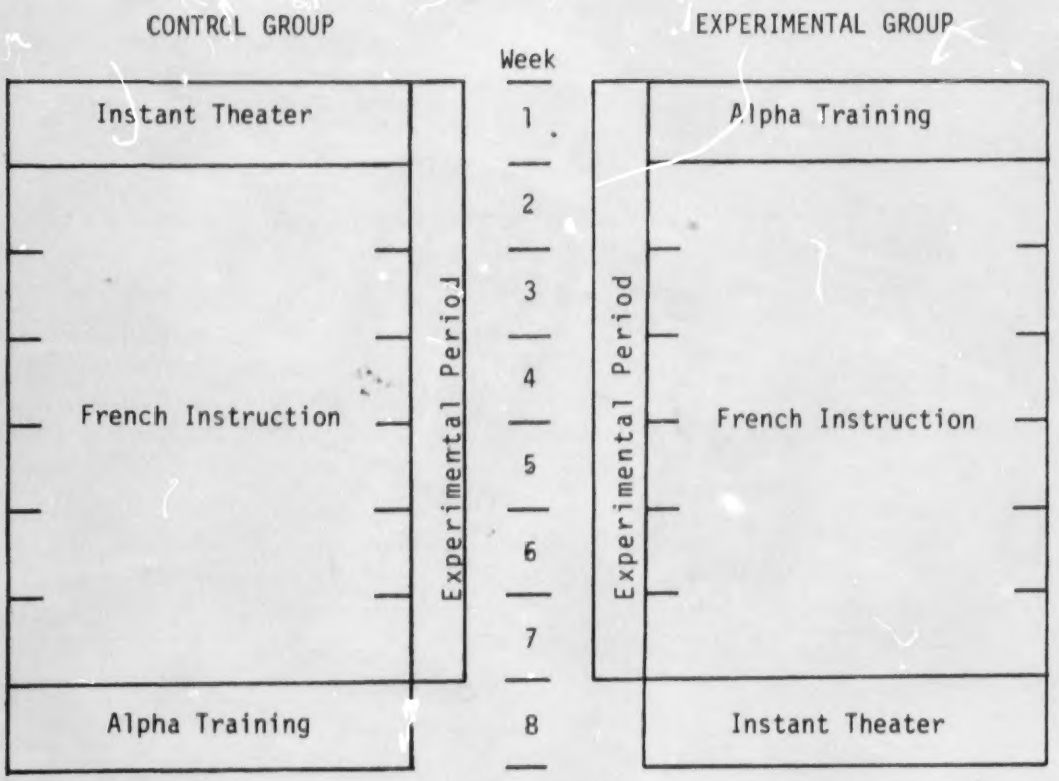

FIGURE 1

TABLE 1

DISTRIBUTION OF INTELLIGENCE QUOTIENTS FOR OTIS–LENNON MENTAL ABILITY TEST

IQ Interval	f
145 - 149	1
140 - 144	0
135 - 139	1
130 - 134	0
125 - 129	2
120 - 124	2
115 - 119	5
110 - 114	2
105 - 109	4
100 - 104	11
95 - 99	11
90 - 94	9
85 - 84	6
80 - 84	5
75 - 79	3
TOTAL	62

TYPES OF TRAINING

Alpha Training

The children had one week of concentrated (3 hours per day) experiences in alpha training, Group T at the beginning and Group C at the end of the study. During the instructional phase, Group T received 10 minutes of training each morning after the daily testing session. Group C received no alpha training until after the posttesting for the study.

Several types of biofeedback instruments and autogenic tapes and exercises were used in the sessions. The biofeedback devices were the encephalograph analyzer, the wrist temperature indicator, and the galvanic skin response monitor (GSR^2). Although the researcher verbally conducted many of the training sessions without any training aids, at times the autogenic tapes from Edward A. Charlesworth's "Stress Management Program" (1981) were used.

Encephalograph Analyzer

The Autogen 120a, adapted so that the student would hear mood music on a tape recorder when the brain wave frequency was between 8 and 12 cycles per second, gave continuous auditory feedback to the student during the training sessions. In order to accommodate the large number of students, training sessions on the EEG units were limited to 10 minutes.

Since the study dealt with language acquisition, the two active sensors or electrodes were placed on the left hemisphere, the hemisphere associated with verbal learning. One active sensor was placed above the ear on the temporal lobe and the other one situated at the back of the head on the occipital region. The ground electrode, which serves as a common mode reference and minimizes artifact interference, was placed on the forehead, an inch above the left eye. The two active sensors picked up EEG signals from the two brain sites and the Autogen 120a amplified this information as a differential measurement between and two sites. When the alpha state was achieved, music was introduced into the right ear.

Project SPEED LEARN purchased three Autogen 120a units. These units were connected to an Autogen 5500 multi-channel data acquisition system which gave the researcher continuous digital readouts of instantaneous brain wave frequency and accumulated average frequencies within two-minute time intervals and over the ten-minute training sessions. Accumulated measures were printed on paper tape, providing a permanent record of each training session.

Each student in the treatment group trained on the EEG unit at least three times during the initial training period and periodically during the second phase of the study. Although adults find it difficult to stay in the alpha range of brain activity for periods of time as long as ten minutes, the preadolescents were able to do so with little practice.

Wrist Temperature Indicator

Another biofeedback instrument used in the study was the wrist temperature indicator, a product of Bio-Temp, Incorporated. The Bio-Temp band, worn like a wrist watch, utilizes crystal technology. The indicator, with a temperature range of 72°F to 100°F, was found to be extremely sensitive to skin temperature changes. Changes in temperature produced a change in color, representing graduations of one-half degree, and a numeric reading with a range of two degrees. Pre- and posttraining readings were recorded on each student in the treatment group during the initial phase of training and in subsequent sessions.

Since a rise in wrist temperature usually is associated with a relaxed mind, the researcher was anxious to ascertain the relationship between wrist temperature and brain wave activity. A unit research study, reported later in the report, relates this association.

Galvanic Skin Response

The GSR^2 unit, a small training device which fits in the palm of the hand with metal sensors for the fingers, was also used to induce relaxation in the students. The galvanic skin response measures autonomic arousal by recording the changing resistance of the skin. The major component is the sympathetically controlled sweat gland. The more the subject perspires, the more electric current the skin conducts, and the GSR^2 produces a tone which increases in frequency. The biofeedback instrument, instead of recording the information on a piece of paper, feeds the information back to the individual by sound. Thus, by reducing the sympathetic arousal, the sound would decrease in pitch (as skin resistance increases). The unit had an earphone attachment so it could be used for individual training without disturbing others. The GSR^2 unit was used periodically in the training sessions.

Autogenics

A technique developed by Luthe (1959) and known as autogenic training also was used in the alpha instruction. Autogenics is a method in which the mind is used to control the body through suggestion and visualization. The suggestion and visualization exercises involve imagining (1) heaviness in the arms and legs, (2) warmth in the extremities, (3) a quiet and regular heartbeat, (4) calm and regular breathing, (5) a warm solar plexus, and (6) a cool forehead. Authorities (Green and Green, 1977; Brown, 1974, 1977, and 2980; and

Anderson, 1978) suggest autogenics as an excellent technique to combine with EEG training for learning to control the brain wave patterns.

Autogenic exercises were practiced everyday during the initial training phase and at least three times per week in the relaxation sessions which preceded the French instructional periods. The researcher also suggested that the student practice the suggestion and visualization exercises at home in the afternoon and on weekends.

An Investigation of the Use of Wrist Temperature as a Measure of Principal Brain Wave Frequency

Despite the present sophistication of EEG monitors, measurement of the principal brain wave frequency remains a time-consuming task, requiring attendance by a technician using expensive equipment operating on a single subject, one at a time. Clearly, the measurement task could be facilitated substantially if another comparable measure of relaxation status could be found which could be made cheaply and simultaneously on a group of subjects.

The skin temperature at the wrist, an increasing function of the volume of blood circulating to the extremities, seemed a reasonable candidate to be a proxy for the EEG dominant frequency. The study investigated the concurrent validity of the skin temperature at the wrist and the principal frequency of the brain wave. The examination was made during a one-week period with 30 boys and girls, aged 10 to 14 years, who were receiving alpha training. The children were in the experimental section of a research design which investigated the effects of alpha training on learning.

Conceptually, the investigation sought to assess the association between two measures of relaxation status, the principal brain wave frequency and the wrist temperature. The former measure was made on an Autogen 120a encephalograph analyzer. Two different types of observations were recorded: (1) the instantaneous dominant brain wave frequency (IEEG), and (2) the average dominant brain wave frequency over a 10-minute interval (AEEG). Wrist temperature was measured as Fahrenheit degrees on a Bio-temp band with the temperature sensor on the same side of the left wrist as the palm of the hand. Preliminary checks with the bands showed them to be quite reliable measures of skin temperature.

Students received three sessions, lasting ten minutes each, of biofeedback training to achieve and maintain the alpha state. Five observations of IEEG and wrist temperature were made at two-minute intervals beginning two minutes into each training session, providing fifteen (3 x 5) pairs of measures for each subject. A single AEEG was observed at the end of each training session, providing three measures per subject. Preliminary work with the

Bio-temp band alerted the researcher to the effect of ambient room air temperature on the measure of wrist temperature. Consequently, as each wrist temperature measure was observed, a corresponding measure of ambient temperature was recorded. If the ambient and wrist temperatures were associated, the association would tend, the researcher believed, to contaminate the measure of wrist temperature and obscure the association between the brain wave frequency and wrist temperature. The air temperature measure could be used to "factor out" or residualize the wrist temperature measure for ambient variation.

Several shortcomings of the limited investigation merit attention. First, a wide range of IEEG and AEEG measures would have helped the investigation. The range of such measures in the present investigation is sharply truncated, since the students were struggling, with increasing success, to keep the brain wave frequency within a narrow window of values between 8 and 12 Hz. Such truncation usually produces biased measures of association, causing the association to appear weaker than it is. The ambient air temperature measures were made in an air-conditioned classroom, again truncating the range of a variable. Finally, in an optimum investigation, a wide range of wrist temperatures should be observed. In this investigation, wrist temperatures varied much more between subjects than within subjects since each sought that relaxed, at-ease state which is conducive to the alpha brain wave state. These comments illuminate the necessity for extreme care in generalizing these results.

The Pearson correlation coefficient between wrist temperature (w) and ambient temperature (a) was found to be slightly positive ($r = 0.21$, $p < .001$). The correlation between wrist temperature and instantaneous brain wave frequency (IEEG) was not significant ($r = -0.08$, $p > 0.05$), perhaps because of a high degree of error in the readings of IEEG from a moving needle on the brain wave analyzer. A much more stable, and therefore reliable, measure is the brain wave frequency aggregated over a ten-minute period (AEEG).

The correlation between w and AEEG is slight, but negative, as anticipated, and significant statistically ($r = -0.12$, $p < .01$). The researcher concluded, then, that wrist temperature could be used as a rough measure of relaxation status, also measured by the brain wave frequency. Whereas the weak correlation between the measures rules out the use of wrist temperature as a substitute for brain wave frequency for individuals, mean wrist temperatures of groups of subjects should be useful as a measure of relaxation status and thus could substitute for a measurement of brain wave frequency. Because the measures were associated, albeit very weakly, the wrist temperatures of the experimental students were measured each morning prior and subsequent to the relaxation exercises. Results of these measures will be reported in the analysis section.

Instant Theater Workshop

The one-week workshop, which met daily for three hours, was designed to provide exercises in instant theater or drama. The students were inspired to exhibit free expression in body movements to the accompaniment of music, poems, stories, etc., and to contrive roles creatively within scenes when given a scenario. During the one-week time frame, each child was encouraged to write and present a ten-minute play, either alone or in a group.

The specific objectives for instant theater were for the student to:

1. use his or her imagination;
2. communicate nonverbally;
3. recall and project sensory experiences;
4. recall and project emotional experiences;
5. create believeable characters; and
6. understand that imagination, pantomine, senses, emotion, improvisation, dialogue, and characterization can be combined in a dramatization that communicates a whole idea.

These objectives were enhanced by conducting the class in an open room from which chairs had been removed.

Video tapes provided instant feedback for further development. Since instant theater was the placebo treatment for the control group, the gadgetry (cameras, monitors, cassette players, etc.) was expected to appeal to the students roughly as much as the biofeedback equipment did to the experimental group.

French Curriculum

The curriculum consisted of listening to tapes of conversational French (45 minutes per day), teacher/student interaction emphasizing speaking French (45 minutes per day), reading comprehension exercises (45 minutes per day) and writing proficiency exercises (45 minutes per day). After the first day's instructional period the first 45 minutes of each day was devoted to the evaluation of learning which ensued from the previous day's experiences.

The two French instructors developed the curriculum to fit the time-frame described above. In addition to using a commercial multi-media program, Perspective Francaises

(1981), the teachers developed some materials. The objectives for the four areas of emphasis are outlined below.

Listening Comprehension. Given a variety of listening activities, the student was expected to verify comprehension by:

(1) distinguishing and discriminating between French and English sounds, French sentences and intonation patterns;

(2) carrying out familiar commands and matching utterances;

(3) selecting appropriate completions to statements or answers to questions; and

(4) recognizing structures and vocabulary which were taught.

Speaking. Given exercises for active participation in conjunction with the listening behaviors, the student was expected to:

(1) reproduce pronunciation, rhythm, stress, elision and liaison;

(2) recite with accurate pronunciation memorized material;

(3) produce appropriate grammatical forms and structures; and

(4) provide oral translations.

Reading. Given a number of expressions to assist the student in perceiving and understanding what is written or printed, the student was asked to:

(1) demonstrate recognition of the written form of familiar sounds or words which were heard;

(2) demonstrate recognition of different spellings of the same sounds;

(3) select appropriate translations for familiar words and sentences; and

(4) demonstrate comprehension of vocabulary words in recombined contexts and match idioms or vocabulary words with definitions.

Writing. Given some activities that require writing in French, the student was expected to:

(1) write grammatical forms correctly as learned;

(2) write familiar material and sentences correctly as they were presented directly by the instructor or on tape recordings; and

(3) describe in writing a magazine picture.

In achieving the objectives the students were exposed to cultural characteristics of the French. Information was provided about modern and ancient customs, traditions and accomplishments by using innovative techniques such as films, filmstrips, tapes, slide presentations, teachers' personal experiences, and charts.

The experimental group received ten minutes less instruction daily than the control group because, in the experimental group, the first ten minutes after the evaluation session each day were spent achieving the alpha state with biofeedback instruments or autogenic exercises. (See Figure 2 for a typical day during French instruction.) The researcher regarded the handicap of reduced instructional time in French as an acceptable trade-off in order to provide time for exercises in alpha training. Such a handicap was justified because no possibility exists arbitrarily for adding time to the school day to achieve the alpha state. Thus, in order to be educationally useful, the results of the study must demonstrate that the relaxation time was a more effective use of time than uninterrupted traditional instruction.

TYPICAL DAY DURING FRENCH INSTRUCTION WEEKS 2-7, 8a.m. ~ 12:00 noon

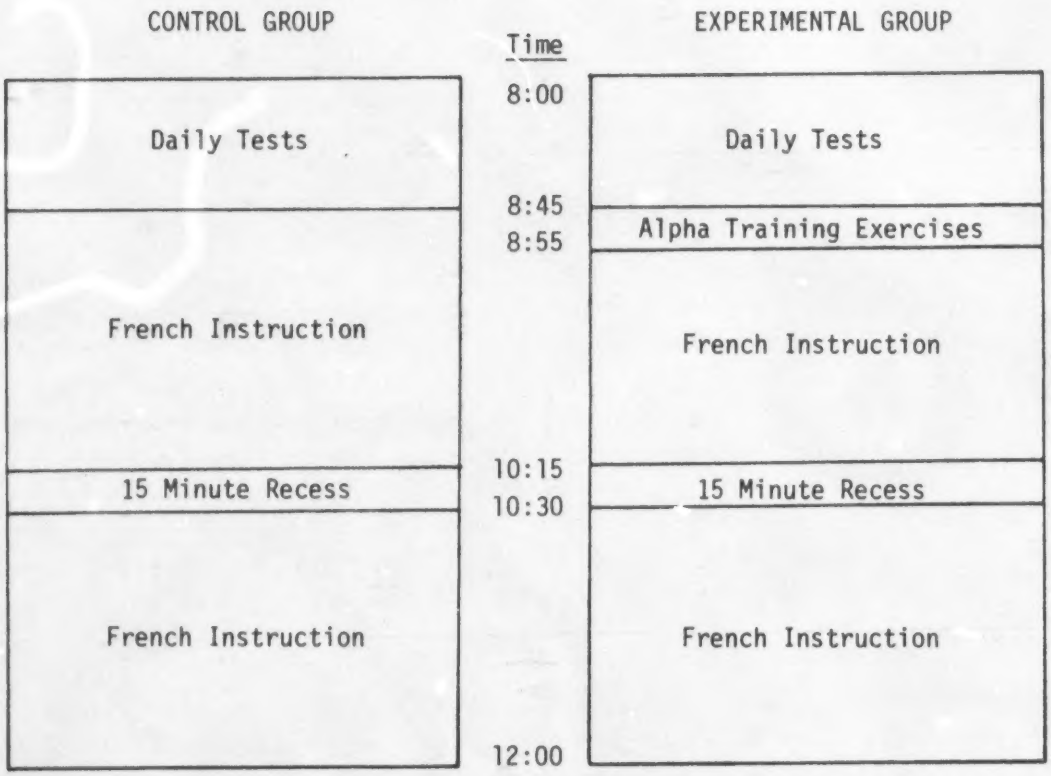

FIGURE 2

INSTRUMENTATION

Subtests of listening comprehension, speaking proficiency, reading comprehension, and writing proficiency of the Pimsleur French Proficiency Tests, Form A, were administered on the final two days of the instructional phase. The Pimsleur, a standardized instrument, was developed to include a representative sample of material commensurate with a beginning French course. Its subtests are described in the following paragraphs.

Listening Comprehension. Test 1 consisted of a magnetic tape with two recorded tracks to which the student listened while responding to the questions on an answer sheet. In Track 1 the student listened to short tape-recorded sentences and chose from among four printed sentences on the answer sheet the one that was spoken. The testing intent, as stated in the manual (1967), was to measure the student's ability to listen attentively, to distinguish individual French sounds in the context of a complete sentence, and to associate the sounds with their written symbols. Track 2 of the test made use of "rejoinder" questions, in which the student heard a conversational statement or questions in French and chose from among four printed French choices on the answer sheet the most appropriate reply. Although student reading ability was also at issue in this part of the test, the printed choices were generally shorter than in the first part and embodied a much more common vocabulary.

Speaking Proficiency. Test 2 was administered by the instructors individually by hearing each student recite. Students were selected randomly for testing by one teacher or the other to improve reliability and objectivity of the measures. Test 2 consisted of three parts. In the first part of the speaking test (vocabulary), the student looked at line drawings depicting common objects and was given four seconds per drawing to name the object aloud in French. In the second part of the test (pronunciation), the student read aloud a number of printed French sentences. For each sentence, the scorer judged as right or wrong the student's pronunciation of two "critical sounds." In the third and final part of the test (fluency), the test booklet was not used. Instead, the student listened to simple questions and answered the questions using complete French sentences. Scoring was done on a four-point scale in accordance with specific verbal criteria outlined in the manual.

Reading Comprehension. In Test 3 the student responded to multiple choice questions after reading French passages of varying lengths and degrees of difficulty dealing with the literal meaning of the passage or with easily drawn inferences about it. Answers were marked on a standard answer sheet and scored by the teachers using an answer key.

Writing Proficiency. The test used a free response format in which the student wrote all of the answers in the test booklet; the tests were scored individually by the teachers. In

the first part of the test, the student read a French paragraph in which certain words were omitted and inserted in the appropriate completions. The missing words included pronouns, demonstrative adjectives, prepositions, and other grammatical elements. The second part, which is also a fill-in exercise, tested the student's ability to write verb forms in various persons and tenses. The test included present, imperfect, past indefinite, and future tenses of regular and common irregular verbs. In the third part, the student wrote complete sentences based on model sentences which required certain modifications, such as changing the number or gender of adjectives, converting nouns to direct and indirect object pronouns, and so forth. Scoring was on a right-wrong basis for each critical element. The fourth and final part consisted of somewhat freer writing tasks based on pictorial stimuli. In the test, the student wrote descriptive sentences for each of several pictures; the time cue "maintenant" or "hier" written above each picture indicated whether present or past tense was to be used. Scoring of the fourth part was carried out subjectively on the basis of guidelines provided in the scoring instruction manual.

Normative data for the listening, reading, and writing tests were based on the results of a standardization study involving 4,543 first level French students. The speaking proficiency test does not have normative and other statistical data available and therefore cannot be classified as a standardized test.

According to Hakstian (1972), data on validity are well presented in the test manual. A breakdown of items into well defined categories constitutes the content validity data. Concurrent validity is presented in terms of correlations of the various tests (except for speaking proficiency) with final grades and teachers' ratings in a sample of students other than the standardization sample.

Split-half reliability coefficients were reported in the manual for listening and reading tests. They were listening, .74, and reading, .85. Inter-scorer reliability for the writing test was .988.

As mentioned earlier in the description of the sample, the Otis Lennon Mental Ability Test, Form J, was administered during the first week of the experimental period, the one week phase of instant theater or alpha training. This instrument purports to measure the verbal and educational factors involved with general intelligence.

According to the test manual (1968), the standardization sample was chosen to represent the country's educational system, not the population at large. Split-half and Kuder-Richardson reliability tests for Form J show correlations of .94 for both. The Seventh Mental Measurement Yearbook (Milholland, 1972) reports that the discussion of validity in the technical manual is organized in accordance with the content,

criterion-related, and construct categories of the 1966 Standards for Educational and Psychological Tests and Manuals. It further states that the validity research was wide-ranging, and abundant data are provided. The test correlates adequately with educational criteria and with other measures of general scholastic aptitude.

The test may be summarized by using the words of John E. Milholland (1972).

> The construction and norming of the test bespeaks adherence to the highest level of current standards. Sophisticated authorship apparently backed by the publisher's determination to spare no effort or expense has resulted in a product of exceptional merit.

TEST CONSTRUCTION

In addition to the summative Pimsleur tests, daily tests were constructed and administered by the French teachers in the four areas: speaking, listening, writing and reading. (See Appendix A for examples.) During the course of the instruction, content from the Pimsleur Proficiency Tests was included in the curriculum. The teacher constructed tests included the content presented in the course outline found in Appendix B.

Content validity of the tests was determined collaboratively among the researcher and the teachers. The internal consistency reliability of the tests was assessed using the Cronbach alpha formula applied to the daily grades of pupils in both treatment groups who attended at least thirty-three sessions of the French instructional sequence.

Reliabilities were computed for each subtest and for the total. Twenty-three days on which attendance was good were used with twenty students who were present all twenty-three days. The Cronbach alpha statistic is a more general form of internal consistency measurement which may be used, as in this case, as a coefficient of stability. As with any measure of reliability, Cronbach's alpha is defined as the proportion of the observed variance that is true score variance. The formula (Cronbach, 1951) is:

$$\alpha = (m/(n-1))(1-(\Sigma Vi/Vt))$$

Where n is the number of items. ΣVi is the sum of separate item variances and Vt is the variance of the raw score total.

Alpha may range from 0 to 1 where 0 indicates that all the variance is error (the test is totally unreliable) and 1 indicates that all the variance is true variance (the test if totally reliable). It should be noted that the distribution of alpha is not normal and cannot be interpreted as a percentage.

The reliabilities were calculated using computer programs within the Statistical Analysis System (1979). The resulting coefficients are presented in Table 2.

TABLE 2

RELIABILITY COEFFICIENTS FOR FOUR SUBSCORES AND TOTAL SCORE OF TEACHER–CONSTRUCTED DAILY FRENCH TESTS USING THE CRONBACH ALPHA STATISTIC

(N = 20)

Speaking	Listening	Writing	Reading	Total
.886	.915	.950	.940	.990

No precise minimum level exists for reliability coefficients. However, test developers generally strive for coefficients of .8 or higher, while nationally distributed standardized tests seek coefficients of .9. In light of this, the computed reliabilities, ranging from .886 to .990, are more than adequate. It may be assumed that observed test scores are close approximations of true scores.

STAFF

The staff for Project SPEED LEARN during the instructional phase consisted of the principal investigator, assistant project researcher, biofeedback technician/evaluator, an instant theater teacher, an instant theater instructional assistant, two French teachers and two French instructional aides. The instructors were paired with a white instructional aide, the black French teacher was paired with a white instructional aide, and the other French teacher who was white was paired with a black aide.

The majority of the staff was selected from the faculty and students at South Carolina State College. However, two members came from local school districts in or near Orangeburg. Only one member was from out of town: one of the French aides was a student at the College of Charleston.

STATISTICAL FINDINGS OF THE STUDY

In an earlier phase of the present investigation, a negative correlation was established between wrist temperature and principal EEG frequency. This relationship, too weak to allow wrist temperature to be used as a substitute for principal brian wave frequency for an individual, nonetheless may be used reliably for groups of students. On 24 days of French instruction, mean wrist temperature for the experimental group was observed prior to daily relaxation exercises and immediately following the exercises. The mean wrist temperatures are reported in Table 3. In every pair of observations, the final mean temperature was higher than the first. The measures were submitted to a t-test for correlated samples, producing a highly significant value of the test statistic (t_o = 10.93, df = 23, p .0005). Thus, the researcher was convinced that a physiological response accompanied the relaxation exercises and that the experimental group was more relaxed subsequent to the exercises than they were before them. Being satisfied that the experimental intervention had produced an effect in students, the researcher then turned to assess the impact of that effect upon the dependent variables of the study.

Results of Tests of Hypotheses on Four Measures of Proficiency in French

The analysis of variance procedure was used to test the four hypotheses related to the effect of relaxation training on various aspects of learning performance in French. For

TABLE 3

DAILY MEAN WRIST TEMPERATURES FOR STUDENTS IN THE EXPERIMENTAL GROUP MEASURED PRIOR AND SUBSEQUENT TO RELAXATION EXERCISES

(N = 24)

	Temperature (^{o}F)		
Date	Before Exercises	After Exercises	Differences
6-15	90.09	90.79	0.70
6-16	89.67	90.21	0.54
6-17	90.81	91.29	0.48
6-18	90.29	90.83	0.54
6-19	90.36	91.86	1.50
6-22	91.14	92.60	1.46
6-23	90.35	91.46	1.11
6-24	88.98	89.71	0.73
6-25	89.91	90.98	1.07
6-26	90.41	91.72	1.31
6-29	88.31	89.96	1.65
6-30	90.58	90.84	0.26
7- 1	89.50	91.19	1.69
7- 2	90.26	91.74	1.48
7- 6	91.19	92.67	1.48
7- 7	91.76	94.33	2.57
7- 8	92.28	93.83	1.55
7- 9	90.96	93.38	2.42
7-10	90.65	92.50	1.85
7-13	89.59	91.70	2.11
7-15	89.21	91.12	1.91
7-16	89.72	91.58	1.86
7-17	89.15	90.71	1.56
7-20	90.71	91.76	1.05
Mean	90.2450	92.6150	1.3700
Standard deviation	0.9053	1.1495	0.6141

t_o = 10.93, df = 23, p .0005

twenty-six days within the experimentalperiod, pupils in both the experimental and control groups were measured, using tests designed collaboratively by the two French teachers, on four variables: reading, speaking, writing and listening. In addition, a total score was computed for each student by summing the four scores. After making thirteen sets of measures on these five variables, the researcher reassigned the two teachers. The teacher which had been teaching the experimental group was assigned to the control group and vice versa. Thirteen subsequent sets of daily measures were made after exchanging teachers. The teacher exchange was made to control for differential teacher effect within the research design. Each daily within-group mean became the observational unit upon which the analysis of variance was performed. Though tests of various effects on the five variables could have been made within the design, only one effect was germane to the present investigation, the effect of alpha training (the treatment effect) on mean classwide performance. The results of the treatment effect on any variable within this balanced design finally may be determined by reference to four means. These are the mean classwide performance across thirteen observations within each of the two levels of the treatment (alpha training and control) by each of the two teacher orderings. From these four means, the overall mean within each of the two treatment levels may be determined. Since the teacher effect is a random effect, the magnitude of the treatment effect may be assessed by comparing it to the interaction between teacher ordering and treatment level.

In the following tests, each of the five variables will be examined. The mean for each teacher-by-treatment cell will be reported. The two overall within-treatment means will be reported, as well as the difference between them. The value of the F statistic from the analysis of variance will be reported, together with the one-tailed probability of observing such a large value of F when the null hypothesis is true. When that probability drops below a value of 0.01, the research hypothesis will be declared to be supported. Please observe that such a result is significant at the 0.05 level of significance when five independent hypotheses are tested on the same sample. $[(1-0.01)^5 = (1-0.05)]$. Frequently, such a conservative approach to hypothesis testing establishes a "family-wise" level of probability corresponding to the researcher's significance level for the study.

First, the means for the variable, proficiency in reading French, will be examined. As revealed in Table 4, the evidence is inadequate to support an assertion that students given alpha training will learn to read French better than comparable students without such training, even though the experimental group in the study performed slightly better than the control group.

TABLE 4

A TEST OF THE SIGNIFICANCE OF A DIFFERENCE BETWEEN EXPERIMENTAL AND CONTROL GROUPS ON DAILY MEASURES OF PERFORMANCE IN READING FRENCH

	Treatment Group	
	Control	**Experimental**
Initial teacher assignment pattern (13 measures)	5.402	6.185
Second teacher assignment pattern (13 measures)	4.873	5.695
Combined measures (all 26 measures	5.138	5.940
Between-group difference	0.802	

F statistic = 2.48, p = 0.18, not significant

Table 5 reports means and a test of significance for the variable, proficiency in speaking French. Even though the experimental group mean slightly exceeded the control group mean, the evidence is not adequate to assert that a group of students given alpha training will learn to speak French any more proficiently than a similar group without such training.

TABLE 5

A TEST OF THE SIGNIFICANCE OF A DIFFERENCE BETWEEN EXPERIMENTAL AND CONTROL GROUPS ON DAILY MEASURES OF PERFORMANCE IN SPEAKING FRENCH

	Treatment Group	
	Control	Experimental
Initial teacher assignment pattern (13 measures)	2.492	2.478
Second teacher assignment pattern (13 measures)	3.244	3.587
Combined measures (all 26 measures)	2.868	3.031
Between-group difference	0.163	

F statistic = 0.03, p = 0.44, not significant

Table 6 reports means and results of a test for a significant mean difference for the variable, proficiency in writing French. The message of the table is clear. Even though the experimental group exceeded the performance of the control group, one may not use such a small difference to support any claim that alpha training improves the proficiency with which students learn to write French.

TABLE 6

A TEST OF THE SIGNIFICANCE OF A DIFFERENCE BETWEEN EXPERIMENTAL AND CONTROL GROUPS ON DAILY MEASURES OF PERFORMANCE IN WRITING FRENCH

	Treatment Group	
	Control	Experimental
Initial teacher assignment pattern (13 measures)	1.262	1.716
Second teacher assignment pattern (13 measures)	3.975	3.745
Combined measures (all 26 measures)	2.619	2.730
Between-group difference	0.111	

F statistic = 0.00, p = 0.48, not significant

The fourth variable studied by way of daily teacher-constructed tests was proficiency in listening to French. Table 7 reports the means used to test for a treatment effect on that variables. Clearly, the tiny difference in favor of the experimental group provides insufficient basis to assert that relaxation training will improve proficiency at listening to French.

TABLE 7

A TEST OF THE SIGNIFICANCE OF A DIFFERENCE BETWEEN EXPERIMENTAL AND CONTROL GROUPS ON DAILY MEASURES OF PERFORMANCE IN LISTENING TO FRENCH

	Treatment Group	
	Control	Experimental
Initial teacher assignment pattern (13 measures)	6.592	6.513
Second teacher assignment pattern (13 measures)	7.713	7.883
Combined measures (all 26 measures)	7.153	7.198
Between-group difference	0.045	
F statistic = 0.00, p = 0.49, not significant		

Table 8 presents means and a test of mean difference on the total daily score, the sum of the previously reported four subtest scores.

TABLE 8

A TEST OF THE SIGNIFICANCE OF A DIFFERENCE BETWEEN EXPERIMENTAL AND CONTROL GROUPS ON DAILY TOTAL SCORES ON FOUR FRENCH SUBTESTS

	Treatment Group	
	Control	Experimental
Initial teacher assignment pattern (13 measures)	15.752	16.830
Second teacher assignment pattern (13 measures)	19.569	20.663
Combined measures (all 26 measures)	17.661	18.749
Between-group difference	1.088	
F statistic = 0.08, p = 0.41		

Unmistakably, the slight superiority of the experimental group does not provide a basis for assertion that alpha training will improve students' total proficiency in learning French.

The overall result of these five tests is this: no evidence of the superiority of the experimental group vis-a-vis the control group was demonstrated by teacher-constructed daily measures when aggregated over the two classes. No basis was found for expecting students with alpha training to perform superior to comparable untrained students on daily tests of proficiency in the various aspects of learning French.

Results of Tests of Hypotheses on Summative Achievement Scores

Four overall achievement measures were made on all subjects who completed the French classes. The measures were subtests of the Pimsleur French Proficiency Test. The subscales were as follows: speaking, listening, writing and reading. The four scores were summed to produce a total score. Table 9 reports the five t-tests for mean differences on each subscore and the total score between the two groups. In none of the comparisons was a mean difference observed which was statistically significant. The research hypothesis asserted that the group who received alpha training would demonstrate greater French achievement than a comparable group which received no alpha training. The hypothesis was not supported.

TABLE 9

RESULTS OF FIVE t–TESTS FOR MEAN DIFFERENCES BETWEEN EXPERIMENTAL AND CONTROL GROUPS ON THE FOUR SUBSCORES AND THE TOTAL SCORE OF THE PIMSLEUR FRENCH PROFICIENCY TEST

Group	N	Mean	Standard Deviation	t[a]
		Speaking Subscore		
Experimental	27	41.33	13.11	1.04
Control	20	36.85	16.50	
		Listening Subscore		
Experimental	27	13.11	4.20	- 0.40
Control	20	13.60	4.04	
		Writing Subscore		
Experimental	27	5.07	4.53	- 0.88
Control	20	6.55	6.96	
		Reading Subscore		
Experimental	27	9.22	3.11	1.09
Control	20	8.30	2.45	
		Total Score		
Experimental	27	68.74	26.29	0.45
Control	20	65.30	25.83	

[a]The critical value of t at the 0.05 level of significance for each test is $t_c = 1.68$. No observed value of t exceeded the critical value.

Results of a Study of Student Retention in the Experiment

Of the 62 students who enrolled in the French classes, 14 dropped out of the project before its end. While parents were urged to encourage their children's attendance, no extraordinary effort was made to ensure the students' continued enrollment. Care was taken to assure that the two groups were treated alike in the discouragement of dropouts. Of the 14 dropouts, only 3 left the experimental group and one of these was hospitalized and could not complete the lessons. Eleven students dropped out of the control group. Table 10 reports the results of a test of the difference of two independent proportions in order to test the following research hypothesis: Students who receive alpha training will drop out of the French classes at a lower rate than comparable students who receive no alpha training. The hypothesis is supported at the 0.05 level of significance.

TABLE 10

RESULTS OF THE FISHER EXACT TEST OF THE DIFFERENCE OF TWO INDEPENDENT PROPORTIONS OF STUDENTS WHO DROPPED OUT OF FRENCH CLASSES BEFORE THE PROJECT'S END

Total number of students	62
Total number of dropouts	14
Proportion of dropouts	0.23
Proportion remaining	0.77
Control Group	
Number of students	31
Number of dropouts	11
Proportion of dropouts	0.355
Experimental Group	
Number of students	31
Number of dropouts	3
Proportion of dropouts	0.097
Fisher exact probability[a] that the two proportions do not differ	0.017*

*Significant at the 0.05 level

[a]Ferguson (1971), Chapter 22, Section 11.

The researcher was interested to determine whether the dropouts in the two groups differed in average intelligence. As mentioned earlier, intelligence was measured prior to the study using the Otis-Lennon Mental Ability Test, Intermediate Level, Form J. The mean IQ for the three dropouts in the experimental group was 95.33. The corresponding mean for the eleven dropouts in the control group was 99.09. The standard deviation for the two groups were 6.81 and 11.07 for the experimental and control groups respectively. The observed value of t was not significant ($t = -0.55$, $df = 12$, $p > .10$). Thus, the evidence does not support the contention that the two groups of dropouts differed in academic aptitude.

Results of the Investigation of Disruptive Behaviors

As soon as the French lessons began, there was evidence that the experimental group, which received daily autogenic or alpha training, seemed more manageable, less overly competitive, and less likely to exhibit disruptive behaviors. In order to measure the frequency of disruptive behaviors, a simple observation form was developed. (See Appendix C for a copy of the form.) Eight types or examples of disruptive behavior were listed for the subject: (1) difficulty concentrating for any length of time; (2) overactivity, restlessness, and/or continual shifting of body positions; (3) disturbing other children by talking, teasing, provoking fights, or interrupting; (4) moving inappropriately out of seat; (5) seeking attention from peers; (6) responding inappropriately to teachers; (7) giggling or laughing inappropriately; and (8) uttering nonsense syllables and/or babbling to oneself. An observer counted the incidence of such behaviors, without regard to the specific type, within a two-minute interval. Observations continued for five consecutive two-minute periods. The total incidences of disruptive behavior were determined by summing the frequency of such behavior in the five time intervals. The same observer made all observations using the same observation form. The two classes were observed on the same day during periods in which the children participated in similar activities. These pairs of observations were used to test the following research hypothesis: Middle school students who receive alpha training and daily relaxation exercises will tend to exhibit fewer incidences of disruptive behavior than comparable students without alpha training and exercises. The Wilcoxon matched-pairs signed-ranks test (Ferguson, 1971) was used to test the null hypothesis. The test statistic, W+, was found to equal 0.00 and therefore was significant beyond the .005 level of significance. In no pair of observations was the number of disruptive behaviors for the control group lower than that for the experimental group. Refer to Table 11 for details of the statistical test.

TABLE 11

REPORT OF FREQUENCY OF DISRUPTIVE BEHAVIORS FOR THE EXPERIMENTAL AND CONTROL GROUPS WITHIN ELEVEN OBSERVATIONS OF TEN MINUTES EACH

	Frequency of Distruptive Behaviors			
Observation	Experimental	Control	Difference	Signed Rank
1	5	15	-10	- 6
2	7	13	- 6	- 4
3	1	8	- 7	- 5
4	5	22	-17	-10
5	4	6	- 2	- 1
6	9	28	-19	-11
7	14	27	-13	- 8
8	10	15	- 5	- 3
9	3	15	-12	- 7
10	17	20	- 3	- 3
11	13	27	-14	- 9

The sum of positive signed ranks, W+, equals 0. Such a statistic is significant beyond the .005 level of significance.

Results of Affective Questionnaire on Instructional Program

The researcher developed an attitude questionnaire to assess students' attitudes on various aspects of the program. Their responses, summarized over the two groups, appear in Table 12. The general impression of the table is one of close agreement. Only one item, Item 12, reflects a substantial disagreement between groups. Though the difference between the groups is significant at the 0.02 level of significance ($\underline{X}2_o = 6.20, \underline{df} = 1, p < .02$), when tested in isolation, if considered as one of 25 tests (one for each item on the questionnaire), the difference fails of significance. Thus, the two groups must be said to differ substantially but not significantly on the item. The item is as follows: Too much French was spoken in the classroom. Whereas only 28 percent of the experimental subjects agree with the statement, fully 67 percent of the control group agreed. The other disagreements on the items of the attitude scale may be attributed readily to sampling error.

TABLE 12

PERFORMANCE OF EXPERIMENTAL AND CONTROL GROUPS ON A LOCALLY DEVELOPED ATTITUDE SURVEY

Item	Experimental Group				Control Group			
	Yes[a]		No[a]		Yes[a]		No[a]	
Attitude toward the Curriculum								
1. I like the way the program was arranged (1 week of creative dramatics, 6 weeks of French, and 1 week of relaxation training).	12	(48)	13	(52)	7	(37)	12	(63)
2. Creative dramatics was fun.	23	(92)	2	(8)	18	(100)	0	(0)
3. I like the creative dramatics classroom with no chairs.	19	(76)	6	(24)	13	(72)	5	(28)
4. I think it is important to learn to relax.	24	(96)	1	(4)	18	(100)	0	(0)
5. I enjoyed learning to control my brain waves.	20	(80)	5	(20)	19	(100)	0	(0)
6. I liked the gadgets (video recorder, EEG analyzer, GSR[2] *, and Bio-temp* bands).	21	(84)	4	(16)	18	(95)	1	(5)
7. French instruction was too difficult for me.	6	(24)	19	(76)	7	(39)	11	(61)
8. Speaking French was the most difficult part of learning French.	15	(60)	10	(40)	13	(68)	6	(32)
9. I like learning French by listening to it.	16	(64)	9	(36)	9	(50)	9	(50)
10. I feel that the daily tests were fair.	14	(56)	11	(44)	8	(44)	10	(56)
11. I feel I did well on the daily tests.	17	(68)	8	(32)	12	(67)	6	(33)
12. Too much French was spoken in the classroom.	7	(28)	18	(72)	12	(67)	6	(33)

TABLE 12—Continued

	Experimental Group Yes[a]		Experimental Group No[a]		Control Group Yes[a]		Control Group No[a]	
Attitude toward the Staff								
13. I felt my teachers cared about me as a person.	14	(74)	5	(26)	16	(84)	3	(16)
14. My teachers made learning fun.	19	(76)	6	(24)	13	(68)	6	(32)
15. The teachers' assistants helped me in the program.	19	(76)	6	(24)	15	(79)	4	(21)
16. The French teachers made me want to visit France and other French speaking countries and places.	20	(80)	5	(20)	10	(53)	9	(47)
17. All the adults were excited about the program.	18	(72)	7	(28)	14	(74)	5	(26)
18. The program's staff made me enjoy coming to school.	12	(48)	13	(52)	6	(32)	13	(68)
Attitude toward Classmates								
19. I like my classmates.	24	(96)	1	(4)	19	(100)	0	(0)
20. My classmates treated me fairly.	18	(72)	7	(28)	16	(84)	3	(16)
21. I believe the difference in ages between students was too great.	5	(20)	20	(80)	7	(37)	12	(63)
22. I tried to compete with my classmates.	5	(20)	20	(80)	8	(42)	11	(25)
Attitude toward the Program								
23. I joined the program to have something to do this summer.	10	(40)	15	(60)	8	(42)	11	(58)
24. I joined the program because my parents wanted me to come.	17	(68)	8	(32)	13	(68)	6	(32)
25. I feel that my summer was well spent.	15	(60)	10	(40)	8	(42)	11	(58)

[a]Frequencies are reported.
Percentages appear in parentheses.

[b]Brand name.

SUMMARY

Project SPEED LEARN examined medium- and long-term acquisition of knowledge (French) of preadolescents with and without alpha training. The original design of the study was for the expressed purpose of seeking a more efficient method of obtaining low-level cognitive knowledge than is presently used in the schools of South Carolina and the United States. A short while after the study started, marked differences in noncognitive behavior began to appear between the control and experimental groups that appeared to be attributable to the treatment. Therefore, the third and fourth research hypotheses were added to the investigation to assess any systematic differences between the groups in terms of the frequency of disruptive behaviors and dropping out of the program.

Altogether, then, the following research hypotheses were tested:

1. Students with alpha training will demonstrate a higher average number of points on all daily tests than comparable students without training.

2. Students with alpha training will demonstrate a higher average score on each of the four subtests–reading, speaking, writing, and listening–and total test of the Pimsleur Modern Foreign Language Proficiency Test: French than comparable students without training.

3. Students who receive alpha training will drop out of the French classes at a lower rate than comparable students who receive no alpha training.

4. Students who receive alpha training will exhibit fewer incidences of disruptive behavior than comparable students without alpha training.

The sample for the study was composed of 62 preadolescent boys and girls, aged 10 to 14, who were selected randomly from a group of 167 middle school students with no previous instruction in French who volunteered to participate in an eight-week summer program consisting of a set of three learning experiences. The three experiences were a six-week course in French, and two special one-week sessions. The special sessions were: (1) a one-week education program in alpha training, and (2) a one-week activity in instant theater. The order of the two special sessions was reversed to comprise the treatment variable. Instant theater served as a placebo and a device for keeping the students blind to the nature of the research design.

As soon as the students had been selected, they were assigned randomly to two groups, a treatment group and a control group. Mental aptitude scores indicated that there were no significant differences in learning ability between the two groups. The treatment groups participated in a one-week alpha training session utilizing autogenic exercises, EEG, and other biofeedback instrumentation aimed at training the child for willful elicitation of the relaxation response while the control group was engaged in instant drama with the video tape serving as instant feedback. After the one-week special sessions, the six-week French instructional period began. The two teacher-aide teams were assigned randomly to the two groups. To control for differential effect of the instructional team, the teams were reversed halfway through the instructional sequence. The only difference between the instruction in the two groups was that the experimental group participated in alpha training for 10 minutes each day immediately after the evaluation period for the previous day's learning and before the instruction for the day. The final week, not included in the experimental phase, was a reversal of the special one-week sessions.

Testing for medium-term recall of the previous day's instruction in the four areas of French–speaking, listening, reading, and writing–was done using teacher-made tests the first period of the day. The Pimsleur instrument, serving as a measure of long-term recall, was administered the last week of the French instructional phase. The analysis of variance procedure was used to test the hypotheses related to the acquisition of French knowledge.

Daily attendance records provided the data needed for retention information. The Fisher exact test of the differences of two independent proportions was used to determine if the drop-out rate differed significantly between the two groups.

An observer recorded on a researcher-designed observation form the number of disruptive behaviors observed during ten-minute periods in the experimental and control groups while the students were engaged in similar activities. The measures were subjected to the Wilcoxon matched-pairs signed-ranks test to test for significant differences.

The results of the study must be interpreted in the light of several methodological limitations. An annoying source of experimental confounding occurred in the study which was recognized too late to be eliminated. Besides the treatment variable, the experimental group differed from the control group in that the experimental group participated in a noncognitive group task, the relaxation exercises, daily. The possibility exists, however improbable, that the observed differences between the groups should be attributed to the group interaction within a nonthreatening context. In subsequent research, this source of confounding should be controlled.

Also, the sample was predominantly black, although a concerted effort was made to attract white volunteers to the program. Six whites began and five whites finished the experimental phase.

With the limitations recognized, the results may be summarized as follows:

1. The students who received alpha training had a higher average number of points on daily teacher-made tests in reading, speaking, writing, and listening than comparable students who did not receive training, but not high enough to constitute a significant difference at the .05 level of significance. Therefore, Hypothesis 1, dealing with medium-term recall of information, was not supported.

2. The experimental group exceeded the control group on mean scores on the Pimsleur subtests, speaking and reading, and total tests, but the control group exceeded the experimental group on writing and listening subtests. However, the mean difference in none of the comparisons was statistically significant. Therefore, it was concluded that alpha training did not improve long-term memory of French. Hypothesis 2 was not supported.

3. Retention data indicated that students with alpha training tended to stay in the program better than students without training. Eleven students dropped out of the control group as compared to three in the experimental group. Hypothesis 3 was supported at the .05 level of significance.

4. Measurement of the frequency of disruptive behaviors of students engaged in similar activities showed the experimental group with far fewer disruptive behaviors. The difference was significant beyond the .005 level of significance. Therefore, Hypothesis 4 was supported.

CONCLUSIONS AND RECOMMENDATIONS

The researcher was somewhat dismayed by the similarity of performance of the two groups on the daily tests and the summative Pimsleur French Proficiency Tests, having expected the experimental group to post significant gains over the control group as a result of the alpha training. Some researchers (Carter and Russell, 1981; and Patmon and Murphy, 1978) working with exceptional children produced gains in reading achievement when using biofeedback alpha training. Other individuals (Luthe, 1969; Sellers, 1974; and Palmeri, 1980), using autogenics or other types of related relaxation procedures, reported increased achievement with high anxiety students or those who were learning-disabled or emotionally disturbed. However, Gracenin and Cook (1977) found alpha training made no significant difference in total reading scores of an experimental group when compared with a control group. For the present study, the children were selected from the general population of preadolescent children who volunteered for the summer program and possessed high anxiety or learning problems no more or no less than is found in such a population.

It must be noted that the experimental group out-scored the control group on the four areas–reading, speaking, writing, and listening–and the total test score on daily tests and on some of the subtests of the Primsleur French Tests, although not enough to be significant. This increase was made with less instruction time. As pointed out earlier in the report, the first ten minutes of the French instructional period for the experimental group was spent in alpha training. The observation made by the researcher was that the time "off-task," at the very least, posed no deterrant to cognitive learning.

The changes in affective behaviors were so noticeable in the experimental group when compared to the control group that other persons working in the school other than the Project SPEED LEARN staff commented about them. The treatment group came to school earlier, missed fewer days, and showed more self control at recess and in the halls (variables not measured in the study). It was not surprising then that analysis of the data on retention and disruptive behaviors showed significant differences between the two groups. The experimental children appeared to be less competitive, showed better attending behaviors, and, in general, were more manageable. The results of the study agreed with other findings in the literature (Luthe, 1969; Sellers, 1974; and Palmeri, 1980) related to affective changes.

Barbara Brown (1977) voices the opinion that alpha training changes attitudes because the training has the tendency to turn the child's attention inward. This conditioning reduces the amount of attention paid to external factors and leads to a decrease in mental tension about social pressures. This effect in turn alters the significance that the individual attaches to external environmental situations and stimuli.

The investigation, as usual, raised more questions than were answered, and, therefore, suggested more research. Further exploration is needed in the area of alpha training and learning with both normal and exceptional children since the literature reports conflicting results. Alpha training tends to produce open-focus, rather than narrow-focus, attention. Perhaps such attending may be more helpful to the higher order cognitive behaviors such as synthesis of ideas, than to the lower order behaviors such as learning and comprehension of simple facts. Such a hypothesis seems more tenable to the researcher after the present investigation than it would have appeared prior to the study and pleads for a rigorous test.

Although the investigation did not find alpha training to be helpful in the rapid acquisition of knowledge, it did appear to change attitudes, evidenced by fewer dropouts and fewer disruptive behaviors in the experimental group. Further research is needed in the regular school program to relate alpha training to self-management, motivation, and participatory skills. With discipline listed as the major problem in schools by both teachers and parents in several opinion polls, a technique which would foster a cooperative attitude should be welcome by all.

The researcher would like to recommend to the curriculum specialists that experiments with alpha training be conducted in the middle schools since positive affective results, with no negative cognitive effects, were observed. Preadolescence, ages 10 through 14, is known as a period characterized by restlessness, uneven temperaments, and emotional tensions. A systematic method for improving the classroom climate appears well worth the effort to implement it.

The results of the study also suggest the possibility that alpha training should be utilized by the counselor to change deviant behavior patterns. The EEG monitor should prove particularly helpful since the student could monitor his or her progress independently.

Clearly, the technique studied here is new and needs much further study. However, the results of the investigation indicated positive affective changes with no ill effects in cognitive behavior.

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APPENDIX A

TEST 10

Name_____ TOTAL SCORE [ ]

LISTENING COMPREHENSION

Listen and circle according to whether you hear (A), (B) or (C). [ ]

1.
A. Il fait beau
B. Il fait chaud
C. Il fait frais

2.
A. l'été
B. l'hiver
C. le printemps

3.
A. Quel âge a-t-il?
B. Quel âge as-tu?
C. Quel âge a-t-elle?

4.
A. un oiseau
B. un chat
C. un daim

5.
A. Neige-t-il en hiver?
B. Neige-t-il en été?
C. Neige-t-il en automne?

6.
A. J'ai de l'argent
B. J'ai faim
C. J'ai vingt francs

7.
A. Nous finissons les devoirs.
B. Vous finissez les devoirs.
C. Ils finissent les devoirs.

8.
A. Tu parles anglais.
B. Tu parles français.
C. Tu parles bien.

9.
A. treize
B. seize
C. douze

10.
A. Qui aime les ballons?
B. Qui aime les enfants?
C. Qui aime les animaux?

WRITING

Complete the following sentences.

1. Il fait froid en _____.
2. Il fait chaud en _____.
3. Quel âge as-_____?
4. Nous avons _____ saisons.
5. Quel temps _____ aujourd'hui.

Answer the following questions in French.

1. Quel âge avez-vous?

_____

2. Quel temps fait-il maintenant?

_____

3. Parlez-vous anglais?

_____

4. Est-ce qu'il fait chaud en été?

_____

5. Quel animal aimez-vous?

_____

READING SCORE

SPEAKING SCORE

TEST 16

Name_____ TOTAL SCORE ☐

LISTENING COMPREHENSION

Listen and circle according to whether you hear (A), (B) or (C). ☐

1.
   A. Que préfère-t-il?
   B. Que désire-t-il?
   C. Que regarde-t-il?

2.
   A. Quel est le huitième mois?
   B. Quel est le troisième mois?
   C. Quel est le septième mois?

3.
   A. Vous achetez trois cahiers.
   B. Vous achetez treize cahiers.
   C. Vous achetez seize cahiers.

4.
   A. Nous invitons nos amis.
   B. Nous invitons nos copins.
   C. Nous invitons nos parents.

5.
   A. Tu prends la carte.
   B. Il prend la carte.
   C. Elle prend la carte.

6.
   A. Y a-t-il du pain?
   B. Y a-t-il du vin?
   C. Y a-t-il du fromage?

7.
   A. Je désire de la salade.
   B. Je désire de la glace.
   C. Je désire de la tarte.

8.
   A. Prenez-vous des oeufs?
   B. Prenez-vous des fruits?
   C. Prenez-vous des légumes?

9.
   A. Ils pèsent les tomates.
   B. Ils pèsent la viande.
   C. Ils pèsent la saucisse.

10.
   A. Super
   B. Souper
   C. Couper

WRITING

Answer the following questions in negative form. ☐

1. Y a-t-il du vin sur la table?

_____

2. Prenez-vous de la glace avant le dîner?

_____

3. Achètes-tu des fruits?

_____

4. A-t-il de l'argent?

_____

5. Aimez-vous la viande?

_____

6. Marie a-t-elle une voiture?

_____

Complete the following sentences with the given verbs.

1. Nous _____ les mains.
   se laver

2. Je _____ Sylvie.
   s'appeler

3. Que _____-tu comme boisson?
   suggérer

4. Qu'est-ce qu'il _____?
   acheter

READING SCORE ☐

SPEAKING SCORE ☐

TEST 22

Name_____ TOTAL SCORE [ ]

LISTENING COMPREHENSION

Listen and circle according to whether you hear (A), (B) or (C). [ ]

1.
   A. l'an
   B. l'on
   C. l'un

2.
   A. la dent
   B. le don
   C. d'un

3.
   A. le vent
   B. le vin
   C. ils vont

4.
   A. parfum
   B. défun
   C. demain

5.
   A. quand
   B. qu'on
   C. qu'un

WRITING

Answer the following questions in affirmative form and use appropriate pronouns instead of underlined words. [ ]

1. Vont-ils à la pâtisserie?

_____

2. Y a-t-il du sucre sur la table.

_____

3. Est-ce qu'il parle à ses amis?

_____

4. Parle-t-il à ses cousines?

_____

5. Travaillez-vous au magasin?

_____

6. Les fermiers ont-ils des vaches?

_____

7. Voulez-vous de la salade?

_____

Complete the following sentences with jouer à or jouer de and make the necessary changes.

8. Mon Père _____ le piano.

9. Les vieux hommes _____ les boules dans le jardin public.

10. Vous _____ la flûte.

READING COMPREHENSION

Read the following passage and answer the questions by circling the appropriate answers (A), (B) or (C). ☐

C'est après midi on joue aux boules dans un petit jardin public. C'est un jeu très populaire en France. Nous voyons ces personnes de tous les âges--des jeunes et des vieux--qui s'amusent aux boules. On joue ce jeu avec cochonnet et des boules.

SELON CE PASSAGE

a. On joue aux boules

A. dans la rue
B. dans le jardin public
C. devant la maison

b. C'est un jeu très populaire

A. en Afrique
B. en Espagne
C. en France

c. On joue ce jeu avec

A. un cheval et des boules
B. un cochonnet et des boules
C. une racquette et des boules

SPEAKING SCORE

☐

APPENDIX B

OUTLINE OF CURRICULUM

I. Structure

A. The definite article

1. Contractions with "de" and with "a"
2. Use of definite article

B. The indefinite article

1. Its use
2. Its omission

C. The noun

1. Gender and number
2. Proper nouns
3. Common nouns

D. Adjectives

1. Formation of the feminine
2. Plural - regular and irregular
3. Position
4. Possessive adjectives
5. Demonstrative
6. Comparative and superlative

E. Pronouns

1. Subject
2. Direct object
3. Indirect object
4. Stress or disjuctive
5. Interrogative (qui, que, qu'est-ce que)
6. Demonstrative

F. Verbs

1. Regular (affirmative, negative and interrogative)
2. Irregular - including reflesive verbs in three forms
3. Present, future, immediate future, past (present perfect, imperfect) and imperative

G. Prepositions

1. Before countries and cities

H. Adverbs (formation)

1. Position of adverbs
2. Adverbs of quantities

I. Sentence

1. Declarative
2. Negative
3. Interrogative

II. Vocabulary

1. Greetings
2. Numbers and dates
3. Weather and seasons
4. Days of the week
5. Months of the year
6. Geographical expressions
7. Telling time
8. Classroom objects
9. Family
10. House (different parts of)
11. Food meals, money
12. Cuisine and table manners
13. Professions
14. Sports
15. Parts of the body
16. Terms for transportation
17. Holidays
18. School subjects
19. Animals
20. Clothes
21. Colors
22. Musical instruments
23. Idiomatic expressions

APPENDIX C

OBSERVATION DATA FORM

Date _____ Teacher _____

Task Observed _____

Disruptive Behaviors

1. Has difficulty concentrating for any length of time.
2. Is overactive, restless, and/or continually shifting body positions.
3. Disturbs other children: talking, teasing, provoking fights, or interrupting.
4. Is inappropriately out o seat.
5. Seeks attention from peers.
6. Responds inappropriately to teacher.
7. Giggles/laughs inappropriately.
8. Utters nonsense syllables and/or babbling to him/herself.

	Sub-total
Recording 1 (2 minutes)	_____
Recording 2 (2 minutes)	_____
Recording 3 (2 minutes)	_____
Recording 4 (2 minutes)	_____
Recording 5 (2 minutes)	_____
Total	_____
Mean	_____